



Attorney Docket No. SPO-591  
MAIL STOP AMENDMENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:                    )  
  )  
MOMODA et al.                            )  
  )  
Serial No.: 09/787,395                    )  
  )  
Filed:           March 19, 2001            )  
  
For:           **METHOD OF PREPARING A CERAMIC ARTIFICIAL CROWN AND  
                  A PREPARATION KIT USED THEREFOR**

**Appendix B**

Please amend the claims as indicated according to 37 C.F.R.  
§ 1.121 concerning a manner for making claim amendments.

1. (Currently Amended) A curable composition which, when  
cured, exhibits an L-scale Rockwell hardness of not smaller than  
60, comprising:

A) a polymerizable monomer which, when homopolymerized,  
exhibits the L-scale Rockwell hardness of not larger than 40;

B) a polyfunctional polymerizable monomer which is  
trifunctional or more highly functional and which, when  
homopolymerized, exhibits the L-scale Rockwell hardness of not  
smaller than 60;

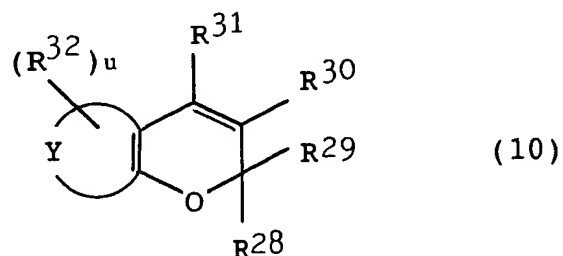
C) a ~~bifunctional~~ difunctional polymerizable monomer

which, when homopolymerized, exhibits the L-scale Rockwell hardness of not smaller than 60; and

D) a photochromic compound having a molecular weight of not smaller than 540.

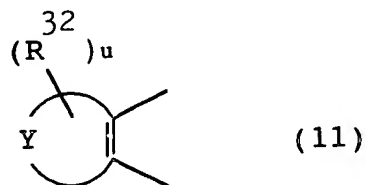
2. (Canceled)

3. (Currently amended) A curable composition according to claim 1, wherein the photochromic compound D) is the one represented by the following general formula (10),



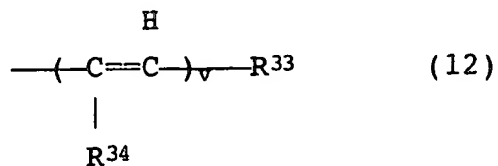
wherein a group represented by the following formula

(11)

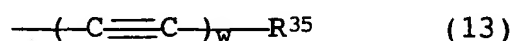


is a substituted or unsubstituted aromatic

hydrocarbon group, or a substituted or unsubstituted unsaturated heterocyclic group, Y represents a portion obtained by removing -C=C- from the aromatic or heterocyclic group,  $R^{30}$ ,  $R^{31}$  and  $R^{32}$  are hydrogen atoms, alkyl groups, alkoxy groups, aralkoxy groups, amino groups, substituted amino groups, cyano groups, substituted or unsubstituted aryl groups, halogen atoms, aralkyl groups, hydroxy groups, substituted or unsubstituted alkynyl groups, substituted or unsubstituted heterocyclic groups containing a nitrogen atom as a hetero atom and in which the nitrogen atom is bonded to a pyran ring or to a ring of the group represented by the above formula (10), or condensed heterocyclic groups in which the heterocyclic group is condensed with an aromatic hydrocarbon ring or an aromatic heterocyclic ring,  $u$  is an integer of 0 to 6,  $R^{28}$  and  $R^{29}$  are, independently from each other, groups represented by the following formula (12),



wherein  $R^{33}$  is a substituted or unsubstituted aryl group, or substituted or unsubstituted heteroaryl group,  $R^{34}$  is a hydrogen atom, an alkyl group or a halogen atom, and  $v$  is an integer of 1 to 3, a group represented by the following formula (13),



wherein  $R^{35}$  is a substituted or unsubstituted aryl group, or a substituted or unsubstituted heteroaryl group, and  $w$  is an integer of 1 to 3, a substituted or unsubstituted aryl group, a substituted or unsubstituted heteroaryl group, or an alkyl group, or  $R^{28}$  and  $R^{29}$  together may constitute an aliphatic hydrocarbon ring or an aromatic hydrocarbon ring.

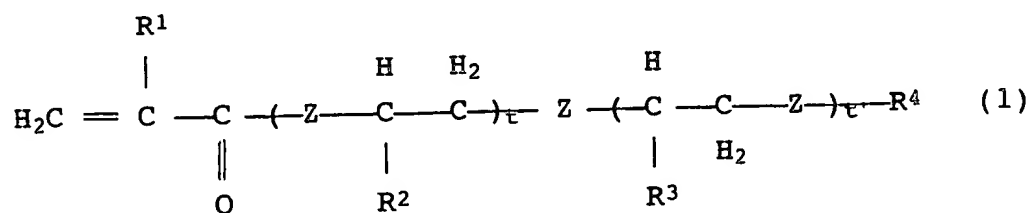
4. (Previously presented) A curable composition according to claim 1, wherein the polymerizable monomer A) which, when homopolymerized, exhibits an L-scale Rockwell hardness of not larger than 40, is at least one kind of a polymerizable monomer

selected from the compounds which satisfy the requirements of L-scale Rockwell hardness of the polymers obtained through the homopolymerization, and which belong to the group consisting of:

- (I) an ethylenic monofunctional unsaturated monomer;
- (II) a polyalkylene glycol polymerizable monomer or a polyalkylenethio glycol polymerizable monomer of which either a hydroxyl group or a mercapto group at the terminal is substituted by methacryloyloxy group, acryloyloxy group, vinylbenzyloxy group, isopropenylbenzyloxy group, vinylbenzylcarbamoyl group, isopropenylbenzylcarbamoyl group or vinyloxy group, and of which other group is not substituted or is substituted by methacryloyloxy group, acryloyloxy group, alkyloxy group, alkoxyalkyloxy group, aryloxy group, acyloxy group, alkyloxy group having an epoxy group at the terminal thereof, haloalkyloxy group or oleyloxy group;
- (III) a substituted or unsubstituted alkylacrylate, or a substituted or unsubstituted long-chain alkylmethacrylate;
- (IV) a hydrocarbon chain (meth)acrylate having an unsaturated bond;
- (V) a compound having at least one epoxy group in the molecule but without a radically polymerizable group in the molecule; and
- (VI) a compound having at least one thioepoxy group in the

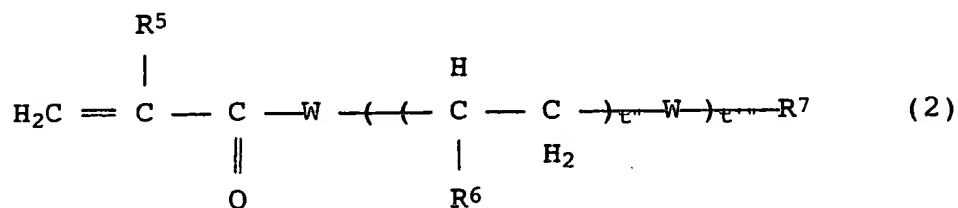
molecule but without a radically polymerizable group in the molecule.

5. (Original) A curable composition according to claim 4, wherein the polyalkylene glycol polymerizable monomer or the polyalkylenethio glycol polymerizable monomer (II) of which either a hydroxyl group or a mercapto group at the terminal is substituted by methacryloyloxy group, acryloyloxy group, vinylbenzyloxy group, isopropenylbenzyloxy group, vinylbenzylcarbamoyl group, isopropenylbenzylcarbamoyl group or vinyloxy group, and of which other group is not substituted or is substituted by methacryloyloxy group, acryloyloxy group, alkyloxy group, alkoxyalkyloxy group, aryloxy group, acyloxy group, alkyloxy group having an epoxy group at the terminal thereof, haloalkyloxy group or oleyloxy group, is a compound represented by the following general formula (1),



wherein  $R^1$ ,  $R^2$  and  $R^3$  are, independently from each other, hydrogen atoms or alkyl groups having 1 to 2 carbon atoms,  $R^4$  is a hydrogen atom, an alkyl group, an alkoxyalkyl group, an aryl group, an acyl group, an alkyl group having an epoxy group at the terminal, a methacryloyl group, an acryloyl group, a haloalkyl group or an oleyl group, Z is an oxygen atom or a sulfur atom, t and t' are, independently from each other, 0 to 70 in average, t + t' is 7 to 70 when  $R^1$  is an alkyl group and  $R^4$  is a methacryloyl group, t + t' is 4 to 70 when  $R^1$  is an alkyl group and  $R^4$  is a group other than the methacryloyl group and acryloyl group, and t + t' is 1 to 70 when  $R^1$  is a hydrogen atom,

or is a compound represented by the following formula (2),



wherein  $R^5$  and  $R^6$  are the same as  $R^1$ ,  $R^2$  and  $R^3$  described above,  $R^7$  is the same as  $R^4$  described above, W is the same as Z described above, t'' is an

integer of 2 to 8,  $t''$  is 7 to 40 when  $R^5$  is an alkyl group and  $R^7$  is a methacryloyl group,  $t''$  is 4 to 40 when  $R^5$  is an alkyl group and  $R^7$  is a group other than the methacryloyl group and the acryloyl group, and  $t''$  is 1 to 40 when  $R^5$  is a hydrogen atom.

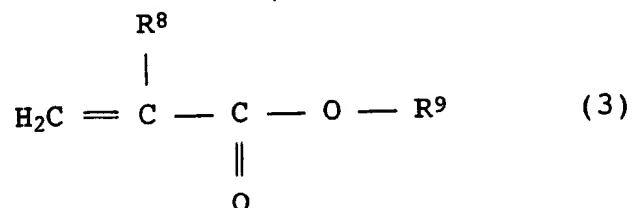
6. (Original) A curable composition according to claim 5, wherein in the general formula (1),  $t + t'$  is 8 to 10 when  $R^1$  is an alkyl group and  $R^4$  is a methacryloyl group,  $t + t'$  is 4 to 23 when  $R^1$  is an alkyl group and  $R^4$  is a group other than the methacryloyl group or the acryloyl group, and  $t + t'$  is 1 to 10 when  $R^1$  is a hydrogen atom.

7. (Original) A curable composition according to claim 5, wherein in the general formula (2),  $t''$  is 8 to 10 when  $R^5$  is an alkyl group and  $R^7$  is a methacryloyl group,  $t''$  is 4 to 23 when  $R^5$  is an alkyl group and  $R^7$  is a group other than the methacryloyl group and the acryloyl group, and  $t''$  is 1 to 10 when  $R^5$  is a hydrogen atom.

8. (Original) A curable composition according to claim 4, wherein the substituted or unsubstituted alkyl acrylate, or the

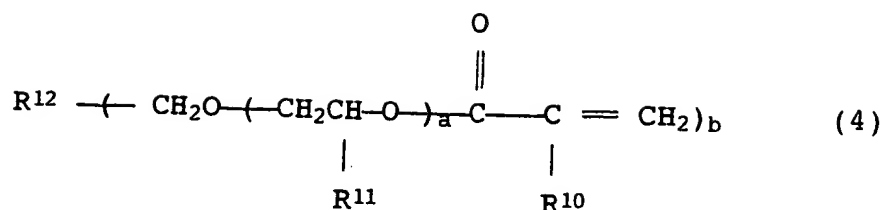


substituted or unsubstituted long-chain alkyl methacrylate (III), is a compound represented by the following general formula (3),



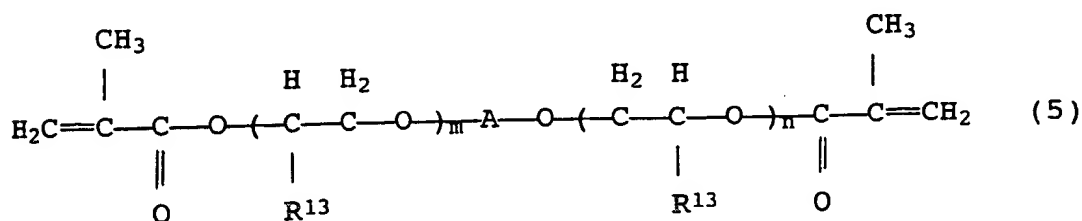
wherein  $\text{R}^8$  is a hydrogen atom or a methyl group, and when  $\text{R}^8$  is a hydrogen atom,  $\text{R}^9$  is a substituted or unsubstituted alkyl group having 1 to 40 carbon atoms and when  $\text{R}^8$  is a methyl group,  $\text{R}^9$  is a substituted or unsubstituted alkyl group having 8 to 40 carbon atoms.

9. (Previously presented) A curable composition according to claim 1, wherein the polyfunctional polymerizable monomer B) which, when homopolymerized, exhibits an L- scale Rockwell hardness of not smaller than 60 is a compound represented by the following general formula (4),

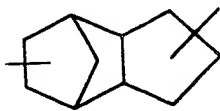


wherein  $\text{R}^{10}$  and  $\text{R}^{11}$  are, independently from each other, hydrogen atoms or alkyl groups having 1 to 2 carbon atoms,  $\text{R}^{12}$  is a trivalent to hexavalent organic residue,  $a$  is 0 to 3 in average and  $b$  is an integer of 3 to 6.

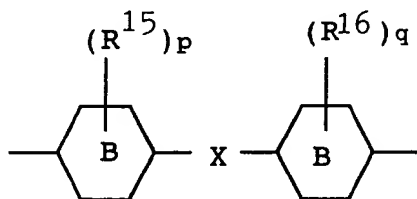
10. (Currently amended) A curable composition according to claim 1, wherein the ~~bifunctional~~ difunctional polymerizable monomer C) which, when homopolymerized, exhibits an L- scale Rockwell hardness of not smaller than 60, is a compound represented by the following general formula (5)



wherein  $R^{13}$  and  $R^{14}$  are, independently from each other, hydrogen atoms or alkyl groups having 1 to 2 carbon atoms, A is a straight-chain or branched-chain alkylene group, a substituted or unsubstituted phenylene group, a group represented by the following formula,



or a group represented by the following formula,



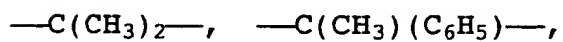
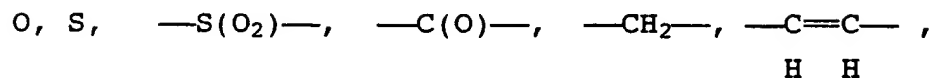
wherein  $R^{15}$  and  $R^{16}$  are, independently from each other, alkyl groups having 1 to 4 carbon atoms, chlorine atoms or bromine atoms, p and q are, independently from each other, integers of 0 to 4, a ring represented by the following formula



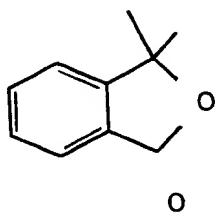
is a benzene ring or a cyclohexane ring, and when the ring represented by the following formula



is a benzene ring, X is ~~anyone~~ any one of the groups represented by the following formulas



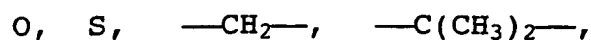
or a group represented by the formula



and when the ring represented by the following formula

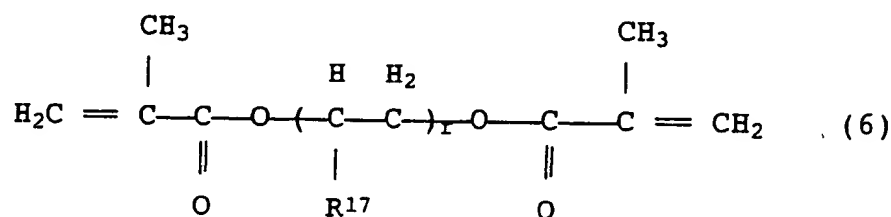


is a cyclohexane ring, X is ~~anyone~~ any one of the groups represented by the following formulas



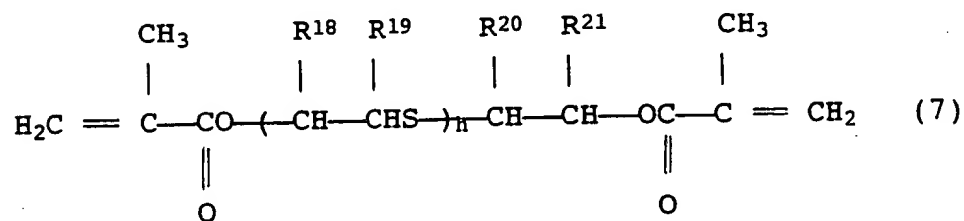
and m and n are not smaller than 1, respectively, and m + n is 2 to 6 in average,

is a compound represented by the following general formula (6)



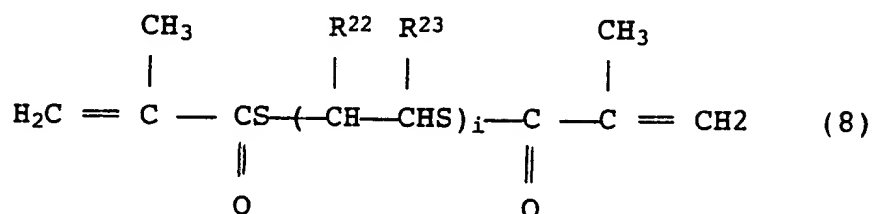
wherein R<sup>17</sup> is a hydrogen atom or an alkyl group having 1 to 2 carbon atoms, and r is 1 to 6 in average,

is a compound represented by the following general formula (7),



wherein  $R^{18}$ ,  $R^{19}$ ,  $R^{20}$  and  $R^{21}$  are the same or different, and are hydrogen atoms or methyl groups, and  $h$  is an integer of 1 to 10,

or is a compound represented by the following general formula (8),



wherein  $R^{22}$  and  $R^{23}$  are the same or different, and are hydrogen atoms or methyl groups, and  $i$  is an integer of 1 to 10.

11. (Previously presented) A curable composition according to claim 1, wherein, on the basis of the total mass of the components A), B) and C),

the content of the component A) is from 1 to 50% by mass;

the total mass of the components B) and C) is from 50 to 99% by mass; and on the basis of the total mass of the components B) and C)

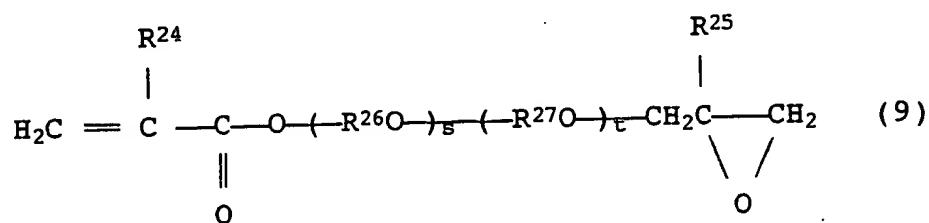
the content of the component B) is from 2 to 50% by mass;

and

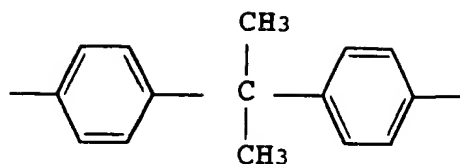
the content of the component C is from 50 to 98% by mass.

12. (Withdrawn) A curable composition according to claim 1, wherein the whole polymerizable monomer contained in the curable composition contains a polymerizable monomer having at least one epoxy group in an amount of from 0.01 to 40% by mass and, preferably, from 0.1 to 30% by mass.

13. (Withdrawn) A curable composition according to claim 12, wherein the polymerizable monomer having at least one epoxy group is a compound represented by the following general formula (9),



wherein  $\text{R}^{24}$  and  $\text{R}^{25}$  are, independently from each other, hydrogen atoms or methyl groups,  $\text{R}^{26}$  and  $\text{R}^{27}$  are, independently from each other, alkylene groups which may be substituted by a hydroxy group and having 1 to 4 carbon atoms, or groups represented by the formula



and s and t are, respectively, 0 to 20 in average.

14. (Withdrawn) A curable composition according to claim 12, wherein the compound having at least one epoxy group is a glycidyl methacrylate.

15. (Previously presented) A curable composition according to claim 1, wherein the photochromic compound D) is contained in an amount of from 0.001 to 5 parts by weight per 100 parts by weight of the whole polymerizable monomers.

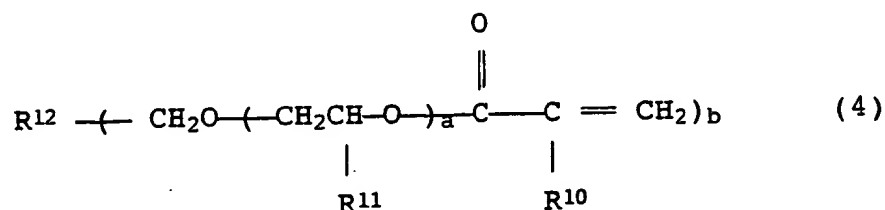
16. (Withdrawn) A photochromic cured product obtained by curing the curable composition of claim 1.

17. (Withdrawn) A photochromic cured product of claim 16, which is a lens.



18. (Withdrawn) A photochromic cured product of claim 16, which is a coated layer on the lens.

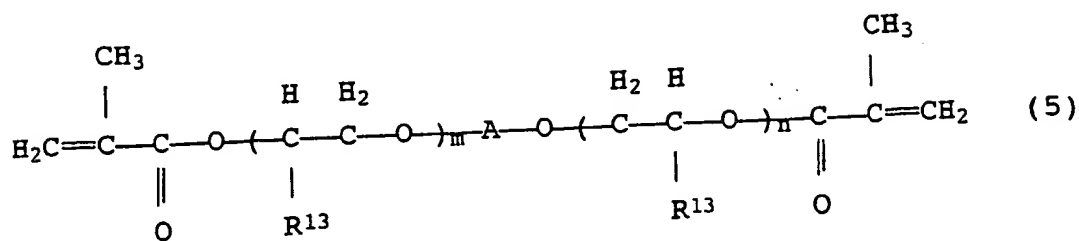
19. (Previously presented) A curable composition according to claim 4, wherein the polyfunctional polymerizable monomer B) which, when homopolymerized, exhibits an L- scale Rockwell hardness of not smaller than 60 is a compound represented by the following general formula (4),



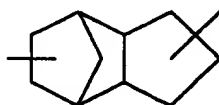
wherein  $\text{R}^{10}$  and  $\text{R}^{11}$  are, independently from each other, hydrogen atoms or alkyl groups having 1 to 2 carbon atoms,  $\text{R}^{12}$  is a trivalent to hexavalent organic residue, a is 0 to 3 in average, and b is an integer of 3 to 6.

20. (Currently amended) A curable composition according to claim 4, wherein the ~~bifunctional~~ difunctional polymerizable monomer C) which, when homopolymerized, exhibits an L- scale

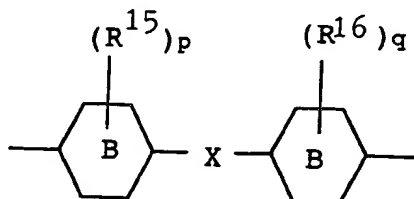
Rockwell hardness of not smaller than 60, is a compound represented by the following general formula (5)



wherein  $R^{13}$  and  $R^{14}$  are, independently from each other, hydrogen atoms or alkyl groups having 1 to 2 carbon atoms, A is a straight-chain or branched-chain alkylene group, a substituted or unsubstituted phenylene group, a group represented by the following formula,



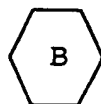
or a group represented by the following formula,



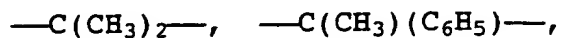
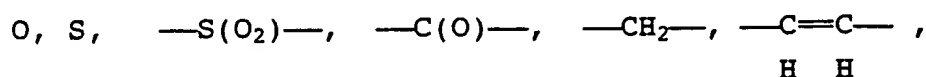
wherein  $R^{15}$  and  $R^{16}$  are, independently from each other, alkyl groups having 1 to 4 carbon atoms, chlorine atoms or bromine atoms, p and q are, independently from each other, integers of 0 to 4, a ring represented by the following formula



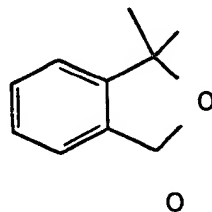
is a benzene ring or a cyclohexane ring, and when the ring represented by the following formula



is a benzene ring, X is any one of the groups represented by the following formulas



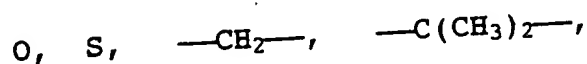
or a group represented by the formula



and when the ring represented by the following formula

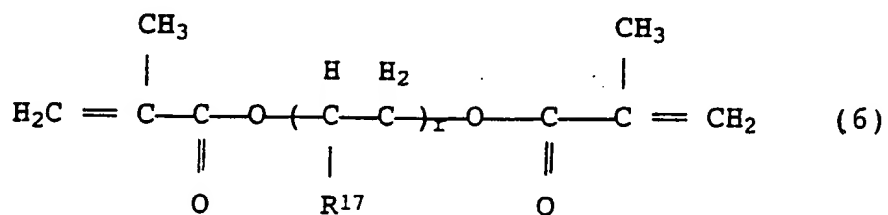


is a cyclohexane ring, X is ~~anyone~~ any one of the groups represented by the following formulas



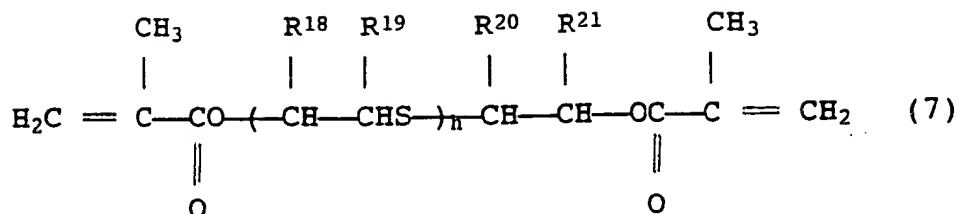
and m and n are not smaller than 1, respectively, and m + n is 2 to 6 in average,

is a compound represented by the following general formula (6)



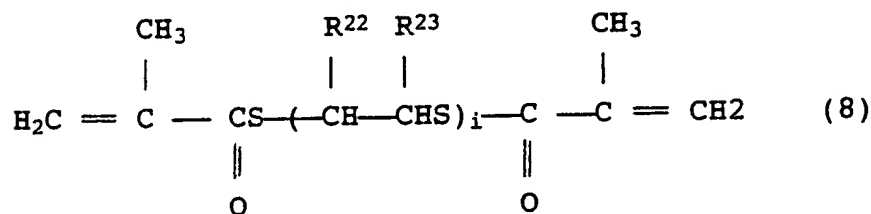
wherein R<sup>17</sup> is a hydrogen atom or an alkyl group having 1 to 2 carbon atoms, and r is 1 to 6 in average,

is a compound represented by the following general formula (7),



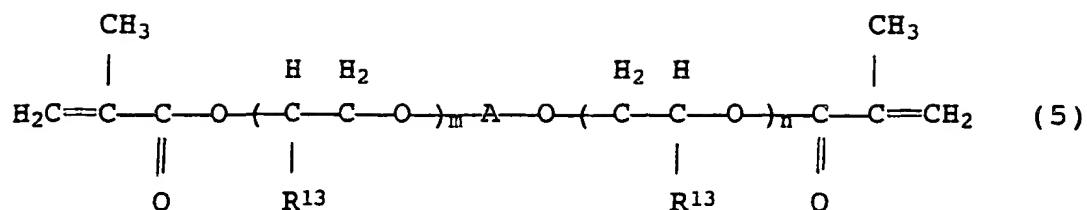
wherein  $\text{R}^{18}$ ,  $\text{R}^{19}$ ,  $\text{R}^{20}$  and  $\text{R}^{21}$  are the same or different, and are hydrogen atoms or methyl groups, and  $h$  is an integer of 1 to 10,

or is a compound represented by the following general formula (8),

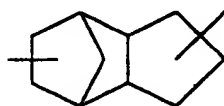


wherein  $\text{R}^{22}$  and  $\text{R}^{23}$  are the same or different, and are hydrogen atoms or methyl groups, and  $i$  is an integer of 1 to 10.

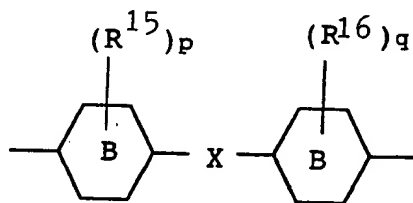
21. (Currently amended) A curable composition according to claim 19, wherein the ~~bifunctional~~ difunctional polymerizable monomer C) which, when homopolymerized, exhibits an L- scale Rockwell hardness of not smaller than 60, is a compound represented by the following general formula (5)



wherein  $\text{R}^{13}$  and  $\text{R}^{14}$  are, independently from each other, hydrogen atoms or alkyl groups having 1 to 2 carbon atoms, A is a straight-chain or branched-chain alkylene group, a substituted or unsubstituted phenylene group, a group represented by the following formula,



or a group represented by the following formula,



wherein  $\text{R}^{15}$  and  $\text{R}^{16}$  are, independently from each other, alkyl groups having 1 to 4 carbon atoms, chlorine atoms or bromine atoms, p and q are, independently from each other,

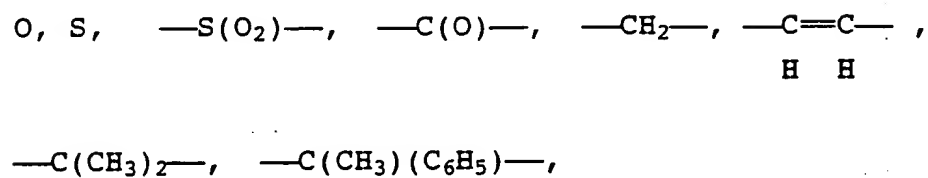
integers of 0 to 4, a ring represented by the following formula



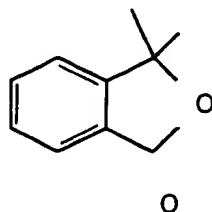
is a benzene ring or a cyclohexane ring, and when the ring represented by the following formula



is a benzene ring, X is any one of the groups represented by the following formulas



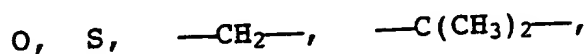
or a group represented by the formula



and when the ring represented by the following formula

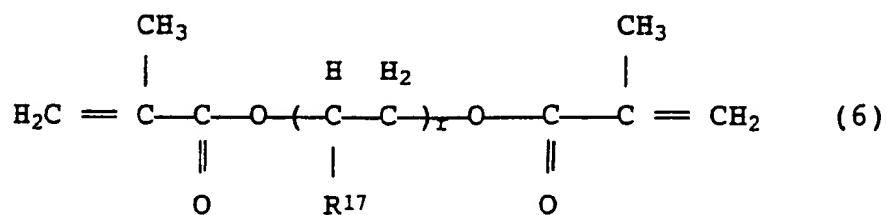


is a cyclohexane ring, X is ~~anyone~~ any one of the groups represented by the following formulas



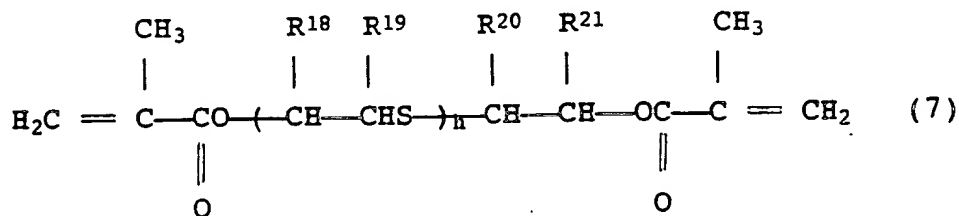
and m and n are not smaller than 1, respectively, and m + n is 2 to 6 in average,

is a compound represented by the following general formula (6)



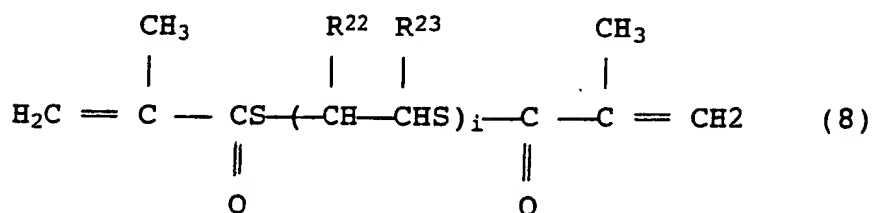
wherein  $R^{17}$  is a hydrogen atom or an alkyl group having 1 to 2 carbon atoms, and r is 1 to 6 in average,

is a compound represented by the following general formula (7),





wherein  $R^{18}$ ,  $R^{19}$ ,  $R^{20}$  and  $R^{21}$  are the same or different, and are hydrogen atoms or methyl groups, and  $h$  is an integer of 1 to 10,  
 or is a compound represented by the following general formula (8),



wherein  $R^{22}$  and  $R^{23}$  are the same or different, and are hydrogen atoms or methyl groups, and  $i$  is an integer of 1 to 10.

22. (Previously presented) A curable composition according to claim 21, wherein, on the basis of the total mass of the components A), B) and C),

the content of the component A) is from 1 to 50% by mass;

the total mass of the components B) and C) is from 50 to 99% by mass; and on the basis of the total mass of the components B) and C)

the content of the component B) is from 2 to 50% by mass;

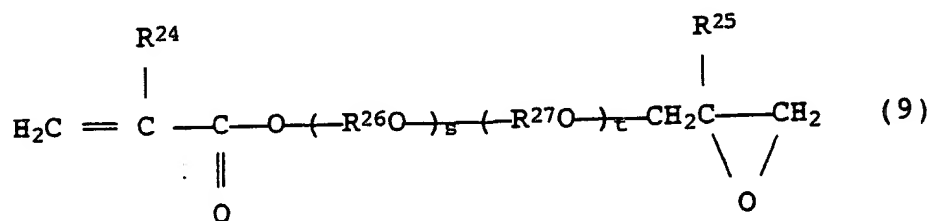
and

the content of the component C is from 50 to 98% by mass.

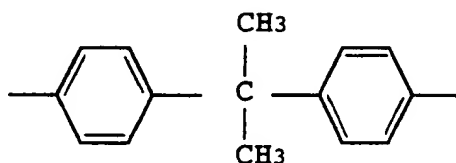
23. (Withdrawn) A curable composition according to claim 11, wherein the whole polymerizable monomer contained in the curable composition contains a polymerizable monomer having at least one epoxy group in an amount of from 0.01 to 40% by mass and, preferably, from 0.1 to 30% by mass.

24. (Withdrawn) A curable composition according to claim 22, wherein the whole polymerizable monomer contained in the curable composition contains a polymerizable monomer having at least one epoxy group in an amount of from 0.01 to 40% by mass and, preferably, from 0.1 to 30% by mass.

25. (Withdrawn) A curable composition according to claim 21, wherein the polymerizable monomer having at least one epoxy group is a compound represented by the following general formula (9),



wherein  $R^{24}$  and  $R^{25}$  are, independently from each other, hydrogen atoms or methyl groups,  $R^{26}$  and  $R^{27}$  are, independently from each other, alkylene groups which may be substituted by a hydroxy group and having 1 to 4 carbon atoms, or groups represented by the formula



and s and t are, respectively, 0 to 20 in average.

26. (Withdrawn) A curable composition according to claim 21, wherein the compound having at least one epoxy group is a glycidyl methacrylate.

27. (Previously presented) A curable composition according to claim 21, wherein the photochromic compound D) is contained in an amount of from 0.001 to 5 parts by weight per 100 parts by weight of the whole polymerizable monomers.

28. (Withdrawn) A photochromic cured product obtained by curing the curable composition of claim 4.

29. (Withdrawn) A photochromic cured product obtained by curing the curable composition of claim 19.

30. (Withdrawn) A photochromic cured product obtained by curing the curable composition of claim 20.

31. (Withdrawn) A photochromic cured product obtained by curing the curable composition of claim 21.